

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
4 July 2002 (04.07.2002)

PCT

(10) International Publication Number  
**WO 02/051711 A1**

(51) International Patent Classification?: **B65D 25/08**,  
51/22, 81/22, 83/04

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(21) International Application Number: PCT/AU01/01664

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(22) International Filing Date:  
20 December 2001 (20.12.2001)

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(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
PR 2301 22 December 2000 (22.12.2000) AU

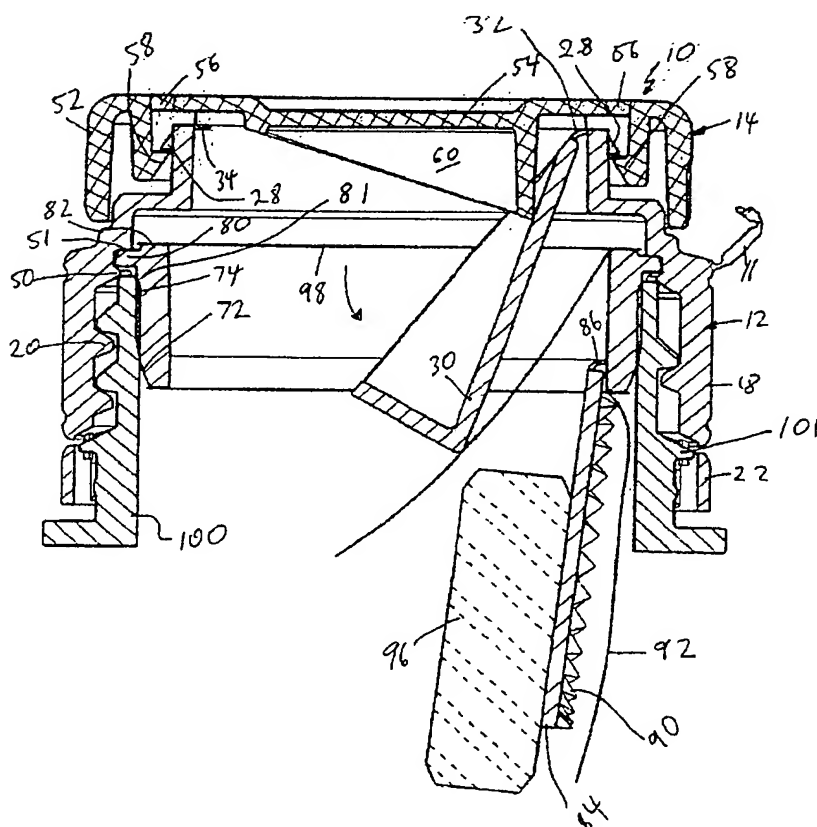
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(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

[Continued on next page]

(54) Title: AN IMPROVED CLOSURE, CAPSULE AND DISPENSING SYSTEM



(57) Abstract: Container closure (10) having a first end to attach to a container opening and a movable inclined surface (30), and a second end having a rotatable actuator (14) which closes a cap portion (12), said actuator occluded by an outwardly extending actuation member (60) which when rotated push away said inclined surface. Capsule (70) having a sealable skirt (72) and an internally located support surface (84) being connected by a hinge (86) to said skirt, said support surface including cutting means (90) so that force exerted onto said support surface will cause it to cut a frangible membrane (92) sealing said skirt. In combination, a closure (10) and a capsule (70) wherein said capsule contains a first substance (96), said combination sealing a container holding a second substance and being used to combine said substances by rotation of said actuator forcing said inclined surface to force said support surface to cut said frangible seal.



CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

- (84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR,

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## **An improved closure, capsule and dispensing system**

### **Field of the invention**

The present invention relates to closures, capsules for use with those closures and dispensing systems to dispense a substance held within the capsule into a second substance held in a container on which the closure and capsule are mounted.

### **Background of the invention**

Containers which hold two substances in separate compartments and which allow one of the substances to gain access to the other substance for intermixing, forming solutions etc are known. However such containers tended to be complicated to manufacture and assemble. The present invention seeks to ameliorate at least in part, at least one of the disadvantages of prior art systems of this type.

### **Summary of the invention**

Present invention relates to a closure for a container, said closure having a cap portion with means to attach to a container opening at a first end, and at a second end having means to rotatably mount an actuator which partially or wholly closes said cap portion, said actuator being constructed with one end being at least partially occluded by an occlusion member, said occlusion member including an actuation member extending away from said occlusion member, said first end of said cap portion including a moveable inclined surface to be engaged by said member whereby rotation of said actuator relative to said cap portion causes said member to engage said inclined surface to thereby push said surface away from said actuator.

The inclined surface is preferably hinged at one point to said cap portion. The inclined surface can additionally be secured by frangible or breakable connections at one or more securing locations to said cap portion. Preferably the inclined surface is secured by one frangible or breakable connection at one other location, preferably opposite the location at which it is hinged to said cap portion. The rotation of said actuator relative to said cap portion causes the breaking of said breakable or frangible connections, thus leaving said inclined surface remains hingedly connected to said cap portion.

The actuation member can be formed from an obliquely truncated cylinder. The obliquely truncated cylinder can be formed integrally with said occlusion member.

The inclined surface can be formed from a obliquely truncated cylinder, whereby the inclined surface is formed along the oblique truncation.

The cap portion can include at least one shoulder so as to rotatably receive said actuator. The actuator can include at least one shoulder so as to be rotatably mounted to said cap portion. The shoulders can be annular or part annular, continuous or discontinuous.

5 The actuator and cap portion can be moulded in juxtaposed locations and connected by an interconnecting web.

Assembly of said actuator and said cap portion is by said web acting as a hinge so that said cap portion and said actuator are rotated relative to each other around an axis which lies generally perpendicular to the central axes of said cap portion and said actuator. The actuator can snap onto said cap portion with said interconnecting web maintaining connection.

10 The interconnecting web can act as a tamper evident means when the actuator and cap portion are assembled.

Preferably said cap portion includes a frangible ring located around an upper portion thereof to act as a tamper evident means. The frangible ring can include a recess portion to receive said interconnecting web, so that when said actuator and cap portion are assembled the frangible ring, in use  
15 is able to be pulled away from said cap portion and in doing so break said interconnecting web, thereby allowing said actuator to be rotated relative to said cap portion.

The cap portion and actuator can have on external circumferential surfaces thereof a moulded grip means which also indicates relative directions of rotation of said cap portion and said actuator.

Preferably said cap portion at said first end also includes a tamper evident mechanism so as to  
20 identify, after said cap portion has been attached to said opening of said container, whether said cap portion has been removed from said container opening.

Preferably said cap portion includes an internal shoulder so as to receive therein a capsule as described below so that removal of the cap portion from said container opening will also remove said capsule.

25 The inclined surface can also include at least one tooth or cutting edge.

The present invention also provides a capsule having a skirt with a first sealable rim at a first end and second sealable rim at a second end, said first and second ends respectively having first and second membranes to seal the volume between said first and second ends, said capsule having an internally located support surface to support a substance to be dispensed from said capsule, said support  
30 surface including cutting means between said support surface and said first end so that in use force exerted onto said support surface will cause said cutting means to engage and then cut said first membrane.

The cutting means includes one or more teeth and or a knife like formation.. The cutting means can be positioned near to the periphery of said support surface.

5 The capsule can have a space between said support surface and said second rim to house the substance to be passed out of said capsule. The substance can be a solid, liquid or gas or a combination of these. The substance can be used to transfer force to said support surface to thus break said frangible membrane on said first end.

The support surface can be connected by frangible connectors to other internal portions of said skirt so that when force is exerted onto said support surface the frangible connectors will break leaving said support surface hinged to the skirt.

10 An external surface of said skirt can include a radially outwardly extending annular flange.

The radially outwardly extending annular flange is adapted to be received inside of said cap portion of said closure described above to thereby seal with a rim of an opening of said container. The capsule when said first and second ends are sealed with a membrane serves as a plug means to occlude a container opening with said capsule being held in sealing engagement to said container opening by said cap portion.

15 The support surface can be rotatably connected to said skirt near at or neat to said first end, and is preferably displaced therefrom. The support surface is rotatably connected to said skirt by a hinge.

A stop can be provided whereby once said support surface has rotated past said stop it cannot return past said stop. Preferably the stop requires a portion of said support surface to deform to allow said support surface

20 Alternatively the support surface can be held by frangible connectors to said skirt, and when said support surface cuts said first membrane, said support surface remains connected to said first membrane which remains connected to said skirt.

25 The invention also provides in combination, a closure and capsule as described above, said capsule containing a first substance and a frangible seal at least on said first end of said capsule, said closure and capsule sealing a container opening of a container holding a second substance, said closure and capsule being used to mix said first substance with said second substance by means of rotation of said actuator forcing said inclined surface to exert force onto said first substance thereby moving said support surface towards said frangible seal on said first end to thus cut or break said frangible seal

30 allowing said first substance to access said second substance.

If said first substance is a gas or liquid the seal or membrane located on said second end of said capsule has preferably sufficient elasticity so as not to break when force is exerted from said inclined surface.

5 Preferably said first substance is a generally circular tablet and said support surface has a ring of cutters therearound so that a circular opening is formed in said frangible seal at said first end of said capsule allowing said tablet to fall therethrough.

Preferably said capsule has two sealing locations with said opening, a first location being with the internal surfaces of said opening of said container and a second being with the outer rim of said opening.

## 10 **Brief description of the drawings**

An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 illustrates a perspective view of a closure;

Figure 2 illustrates a cross section through the closure of figure 1;

15 Figure 3 illustrates an underneath perspective view of a capsule for use with the closure of Figure 2;

Figure 4 illustrates a cross section through an assembled closure and capsule mounted on an opening of a container each in an unused or closed condition;

Figure 5 illustrates the assembly of figure 4 in a used or open condition;

20 Figure 6 illustrates the closure of figure 1 as mounted on a bottle;

Figure 7 illustrates an underneath perspective view of a modified capsule;

Figure 8 illustrates an upper perspective view of the capsule of figure 7;

Figure 9 illustrates an underneath plan view of the capsule of figure 7;

Figure 10 illustrates a cross-section through line x-y in figure 9;

25 Figure 11 illustrates an upper perspective view of the capsule of figure 7 after use;

Figure 12 illustrates a cross section through another version of a closure and capsule;

Figure 13 illustrates an underneath perspective view of the closure of figure 12;

Figure 14 illustrates an underneath perspective view of the capsule of figure 12;

Figure 15 is an underneath plan view of the capsule of figure 14;

Figure 16 is a cross section through the capsule of figure 14;

Figure 17 is a perspective view of the capsule of figure 14 after use; and

Figure 18 is a cross section of the capsule of figure 17.

### Detailed description of the embodiments

5 As illustrated in figures 1, 2, 4 and 5 a closure 10 has a cap portion 12 and an actuator 14. The cap portion 12 and actuator 14 are manufactured in a juxtaposed position such as that illustrated in figure 1. The cap portion 12 and actuator 14 are formed joined by an interconnecting web 16. The preferred method of manufacture is by injecting moulding however other methods can be utilised.

10 The cap 12 includes a generally cylindrical side skirt 18 in which is formed a screw thread 20 so that the cap portion 12 can be screwed onto a container opening or neck or pour spout (on a cardboard container) having a similarly formed mating thread. The lower end of the skirt 18 includes a tamper evident ring 22 such as is common in bottle caps used at this time. The tamper evident ring 22 passes over a shoulder 101 (see figure 5) on the container opening 100 and once in position over shoulder 101 frangible connectors 24 must be broken to unscrew the cap portion 12 from the container.

15 At the other end of the cap portion 12 is an upper rim 26 around which is located a series of shoulders 28 which have a downwardly diverging upper surface 29, and an undercut lower surface 27. The shoulder 28 is used to rotatably receive and or hold the actuator 14 onto the cap portion 12 as will be described later.

20 Located internally of the rim 26 is an inclined surface 30 which is formed as the closed end of an obliquely truncated cylinder. Extending away from the inclined surface 30 in a generally cylindrical wall 31. The inclined surface 30 is held in the rim 26 by a hinge member 32 and a frangible holding member 34. It will be noted from figure 1, that the frangible holding member 34 has considerably less width by comparison to the hinge member 32. This is so that in use the frangible holding member 34 will break when a downward force is applied to the inclined surface 30.

25 On an external periphery of the cap portion 12 is another tamper evident ring 36 which connects to the cap portion 12 by means of frangible connectors 38 positioned in a generally equi-spaced arrangement around the ring 36. The ring 36 is not of continuous cross section nor is it a continuous ring. At one side as illustrated in figure 1, there is located a break 40 such that the start of the ring 36 has a small handle portion 42 and the end of the ring 36 has a tapered end 44. The tapered end 44 allows  
30 a user to position their finger behind the handle 42 to grab it and thus separate the ring 36 from the cap portion 12.

At a diametrically opposite location to the handle portion 42 the cross section of ring 36 changes to provide a recess or cut out 46 which is provided so that the hinge 16 will sit therewithin once the actuator 14 has been snapped onto the cap portion 12. This recess 46 by means of its side walls and the fact that the hinge 16 sits therein ensures that until the tamper evident ring 36 has been removed from the cap portion 12 no relative rotation can occur of the actuator 14 with respect to the cap portion 12.

The cap portion 12 includes a series of four equi-spaced cavities 48 which allow the mould to form the undercut portion of the shoulders 28.

Beneath the inclined surface 30 the internal surfaces of the cap portion 12 includes four equi-spaced shoulders 50 which are used to retain therein a capsule 70 such as that described later.

The actuator 14 is formed from a general cylindrical skirt 52 with its central portion being substantially occluded by a member 54. The member 54 only partially occludes one end of the cylindrical skirt 52 because four equi-spaced apertures 56 are provided, to allow for the moulding of undercut portions 57 of the shoulders 58 which are formed internally of the skirt 52. Extending away from the member 54 is an actuation member 60 which is affectively an obliquely truncated cylinder being closed at one end by the member 54. The actuation member 60 has a rim 62 which on the side 63 furthest from cap portion 12 extends further away from the member 54 than the side 61 closest to cap portion 12.

To assemble the closure 10 the actuator 14 is rotated in the direction of arrow 64 relative to the cap portion 12 until the shoulders 58 and 28 engage. As there is are angled lead-in surfaces 29 and 59 respectively on the shoulders 28 and 58, the shoulders 28 and 58 are pushed in radial directions relative to each other until the undercut portions 27 and 57 respectively on the shoulders 28 and 58 have engaged as illustrated in the cross sections of figures 4 and 5. At this point the actuator 14 has snapped into position on the cap 12. The hinge 16 remains connected to the cap portion 12 and actuator 14 also as illustrated in figure 4 and the actuation member 60 is received within the cylindrical wall 31 extending from the inclined surface 30. The side 63 of actuation member 60 is in position adjacent the deepest side of the cylindrical wall 31.

Before further describing the function and use of the closure 10 the capsule 70 of figures 3 and 4 will now be described. As illustrated in figures 3 and 4 the capsule 70 is constructed from a generally cylindrical skirt 72 which is made up of a side portion 74 which extends substantially parallel to the central axis through the capsule 70. A tapered portion 76 extends from side portion 72 and tapers on converges towards the central axis. The tapered portion 76 terminates in a sealable rim 78 whilst the side portion 74 terminates in a radially outwardly extending flange 80 on the other side of which is



located a sealable rim 82 as illustrated in figure 4. Between the flange 80 and the start of the side portion 74 is located a radiused shoulder 87.

Near to, but spaced away from, the rim 78 is a support surface 84 which is hingedly connected by means of a hinge 86 to the internal wall 88 of the skirt 72. The support surface 84 is of a generally circular shape. Around the majority of the periphery of the support surface 84 is a series of pyramidal cutting teeth 90 which will cut a generally circular hinged flap (see figure 5) through membrane 92 of figure 4 which is attached to the rim 78 during production. The membrane 92 will need to be of a frangible nature so that the cutting teeth 90 can cut therethrough.

If desired, as illustrated in figure 4, a thin and or narrow holding web 94 can be provided opposite to location of the hinge 86 so as to hold the support surface 84 in position during transportation and manufacture.

To assemble the capsule 70 a membrane 92 is placed upon the rim 78 and a tablet 96 is then positioned upon the support surface 84. Once this is done the capsule is sealed by applying a membrane 98 to the rim 82.

To assemble an assembled capsule 70 and an assembled closure 10 onto a container neck or spout 100, as illustrated in figure 4, a number of methods can be utilised. One is that the assembled capsule 70 is first inserted into the cap portion 12 so that the rim 80 is held within the shoulders 50 of cap portion 12 and shoulders 51 thereby holding the capsule 70 in position. The assembled capsule 70 thus acts as the seal for the container opening 100.

A second method is to locate the capsule 70 into the neck or spout 100 and then to screw on the closure 10.

In the illustration of figure 4, the container opening 100 has a reduced diameter portion 102 by comparison to the portion near the rim 104 such that the tapered portion 76 of the skirt 72 will seal against the reduced diameter portion 102. Additionally, the skirt 72 includes the radiused shoulder 81 which will engage the container opening 100 near to its rim extremity, thus providing a second sealing line or location.

Thus to use the assembly of figures 4, 5 and 6, to dispense a tablet 96 into the substance contained within the container with which container opening 100 communicates, the actuator 14 is first freed to be able to rotate relative to the cap portion 12. This is done by radially outwardly pulling the handle 42 of the tamper evident ring 36 relative to the cap portion 12 which will circumferentially remove the tamper evident ring 36 until it reaches the interconnecting web 16. When it reaches this point additional force is applied to the tamper evident ring 36 to break the interconnecting web 16 at one of or both of its points of connection to the cap portion 12 and actuator 14. Further force applied to

the tamper evident ring 36 will completely remove the tamper evident ring 36 from the cap portion 12. As illustrated in figure 5, the tamper evident ring 36 is no longer present and the interconnecting web 16 has been disconnected from the actuator 14 but remains connected to the cap portion 12.

5 Once the tamper evident ring 36 has been removed and the interconnecting web 16 broken, the actuator 14 can be rotated relative to the cap portion 12. By rotating the actuator 14 some 180 degrees, the actuation member 62 will rotate over the inclined surface 30 which will force the inclined surface 30 to rotate in an anti-clockwise rotation towards the capsule 70 after the holding web 34 has been broken. This will in turn cause the breaking or stretching of the membrane 98 (depending upon the characteristics of the membrane 98) and will cause the inclined surface 30 to apply pressure to the tablet 10 96. This in turn causes the cutting of the membrane 92 and because of the absence of pyramidal teeth 90 near to the hinge 86 of support surface 84, the membrane 92 will remain connected to the rim 78. This will then allow the tablet 96 to fall into the substance contained by the container.

The outside surfaces of the skirts 52 and 18 include a series of gripping formations 110 and 112. The gripping formation 110 and 112 are in the shape of arrowheads. In the case of the actuator 14, the 15 arrowheads indicate the direction of rotation relative to the cap portion 12 in order to force the tablet into the substance contained by the container whilst the arrows 112 indicate the relative direction to rotate the cap portion to remove the cap portion from the container.

Illustrated in figures 7 to 11 is a capsule 170 which is similar in constructional function to the capsule 70 of figures 3, 4 and 5. Parts of capsule 70 having the same or similar construction and or 20 function as parts of capsule 70 are numbered with the same reference numerals.

The capsule 170 differs from the capsule 70 in that the construction of the capsule 170 in the region of hinge 86 is enhanced with additional features. Firstly, the hinge 86 is located between two radially protruding flanges 172 and 174. The flanges 172 and 174 extend in a radially inward direction from the inner wall 88 of the skirt 72.

25 The flanges 172 and 174 provide axially extending forward faces 176 and 178 and side faces 180 and 182.

The support surface 84 includes a cut out 184 and 186 so as to produce edges 188 and 190 which are parallel to the forward faces 176 and 178. The edges 188, 190 and faces 176 and 178 extend in a direction generally parallel to the line of bending of the hinge 86.

30 Extending axially from the flanges 172 and 174 are shoulders 192 and 194 which terminate before protruding past the rim 78 of capsule 170.

The edges 188 and 190 are the intersection of the underside of support surface 84 and angled rear faces 196 and 198 (see figures 8 and 10) on the topside of support surface 84. These angled rear faces are preferable for ease of moulding the support surface 84. If desired they need not be angled. Thus, when actuator 14 is rotated relative to the cap portion 12 and actuation member 62 moves inclined surface 30, causing the breaking or stretching of membrane 98, resulting in the application of force to a tablet 96, this will break holding web 94 and force and or deform the edges 188 and 190 past the forward faces 176 and 178 and around and past shoulder 192 and 194 as the shoulders 192 and 194 extend axially downwardly and the edges 188 and 190 deform to push past the shoulders 192 and 194, the shoulders 192 and 194, thus prevent the support surface 84 from returning, by means of shape surface memory of the plastic, or other means to its starting orientation. This is illustrated in figure 11.

Other differences between the capsule 170 and capsule 70 is that capsule 70 is that the capsule 170 has a support surface 84 which has force pyramidal teeth 200 which are longer than the rest of the teeth 90. Two are located diametrically opposite the hinge 86 and two are circumferentially spaced therefrom.

This is to help the initial nurturing of the membrane 92, with the teeth 200 being the first to pierce the membrane, with the other teeth 90 following in a progressive or requital manner.

Another feature of the capsule 170 not present in the capsule 70 is the equi-spaced shoulder formations 205. These shoulder formations 205 can be provided to assist in preventing the upper extremity of rim 104 (see figure 4) from pushing the equi-spaced shoulders 50 (see figure 4) in a radially out word direction when the cap portion 12 is screwed onto a container reek 100. If desired, rather than discrete equi-spaced shoulder 205 circumferential shoulder can be provided.

The substance contained in the capsule 70 can be any one or more of a gas, a liquid, a powder, granules, a solid formation such as a tablet.

Illustrated in figures 12 to 13 is a closure 10', similar to the closure 10 of figures 1,2 4, 5, and 6 and a capsule 70' similar tot eh capsule 70 of figures 3,4 and 5. Like parts have been like numbered. The differences between the closure 10' of figures 12and 13 and closure 10 of figures 1,2 4, 5, and 6 is that the closure 10' has at the centre and lower most tip of the inclined surface 30 a cutting tooth 33 so that as the inclined surface 30 rotates into contact with the upper membrane 98 on the capsule 70' in figure 12, the membrane 98 will be pierced.

Another difference is that the inclined surface 30 terminates in a flat section 35 adjacent to the cutting tooth 33.

Illustrated in figures 12, and 14 to 18 is the capsule 70', as mentioned previously those like features of the capsules 70 and 70' have been ;like numbered. The differences between the capsules 70'

and 70 is that the capsule 70' includes five equi-spaced holding webs 94 and does not have a defined hinge member 86.

5 The support surface 84 also is different in that there are provided twelve equi-spaced cutting teeth 90 which are preferably spaced at approximately 30 degrees from each other. Between the teeth 90 the rim of the support surface has a knife like formation to assist in the cutting of the membrane 92.

Another difference is that the support surface 84 has a downwardly extending cylindrical wall which terminates in an annular surface 85. The annular surface 85 is joined to the membrane 92 when the membrane 92 is joined to the sealable rim 78.

10 Thus in the closure 10' and capsule 70' is actuated, the tooth 33 will pierce the membrane 98 and the surface 35 will engage the tablet 96, allowing the transfer of a downward force to the support surface 84. This will result in the breakage of the webs 94 generally those being to the left of the hinge 32 which connects the inclined surface 30 to the closure 10'. In most cases only three of the five webs 94 will break, while in some cases four or all will break.

15 If one or two webs 94 are left in tact then these intact webs 94 will act as a hinge member with the supporting surface 84 pivoting around them.

Otherwise if all 5 webs break in use as illustrated in figures 17 and 18, the support surface 84 will remain attached to the separated portion of the membrane 92, whereby the support surface 84 will remain hingedly connected to the rim 78 of the capsule 10, by means of the uncut or unseparated portion of the membrane 92.

20 While the surface 85 is annular in configuration, if desired it can be circular or any other appropriate shape. However the annular nature of the surface 85 and the cylindrical wall that it is the terminus of, assists in the moulding of the components.

25 The attachment of the central portion of the membrane 92 to the annular surface 85 which will result in the side of the support surface 84 which is beneath the hinge 32 being prevented from contacting the membrane 92, which will help to keep a portion of the membrane 92 connected to the rim 78.

30 A particular advantage of the capsule 70' over the capsules 70 and 170 described above is that the capsule 70' is non directional due to the absence of a specific hinge member. Thus the assembly procedure of the capsule 70' into the closure 10' does not require a specific orientation of the components thus making assembly easier and quicker.

It will be understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text or drawings. All of these different combinations constitute various alternative aspects of the invention.

5 The foregoing describes embodiments of the present invention and modifications, obvious to those skilled in the art can be made thereto, without departing from the scope of the present invention. The shape of the embodiment is generally cylindrical however the invention can be applied to other shape components as well.

## Claims

1. A closure for a container, said closure having a cap portion at a first end with means to attach to a container opening, and at a second end having means to rotatably mount an actuator which partially or wholly closes said cap portion, said actuator being constructed with one end being at least partially occluded by an occlusion member, said occlusion member including an actuation member extending away from said occlusion member, said first end of said cap portion including a moveable inclined surface to be engaged by said member whereby rotation of said actuator relative to said cap portion causes said member to engage said inclined surface to thereby push said surface away from said actuator.
2. A closure as claimed in claim 1, wherein said inclined surface is hinged at one point to said cap portion.
3. A closure as claimed in claim 1 or 2, wherein said inclined surface is secured by frangible or breakable connections at one or more securing locations to said cap portion.
4. A closure as claimed in claim 2 or 3, wherein said inclined surface is secured by one frangible or breakable connection at one other location.
5. A closure as claimed in claim 4, wherein said one other location is opposite the location at which said inclined surface is hinged to said cap portion.
6. A closure as claimed in any one of claims 3 to 5, wherein rotation of said actuator relative to said cap portion causes the breaking of said breakable or frangible connections, whereby said inclined surface remains hingedly connected to said cap portion.
7. A closure as claimed in any one of the preceding claims, wherein said actuation member is formed from an obliquely truncated cylinder.
8. A closure as claimed in claim 7, wherein said obliquely truncated cylinder is formed integrally with said occlusion member.
9. A closure as claimed in anyone of the preceding claims, wherein said inclined surface is formed from a obliquely truncated cylinder, whereby the inclined surface is formed along the oblique truncation.
10. A closure as claimed in any one of the preceding claims, wherein said cap portion includes at least one shoulder to rotatably receive said actuator.

11. A closure as claimed in any one of the preceding claims wherein said actuator includes at least one shoulder so as to be rotatably mounted to said cap portion.

12. A closure as claimed in claim 10 or 11, wherein said at least one shoulder is one of the following: annular, part annular, continuous, discontinuous.

13. A closure as claimed in any one of the preceding claims wherein said actuator and cap portion are moulded in juxtaposed locations and connected by an interconnecting web.

14. A closure as claimed in claim 13, wherein said actuator and said cap portion are assembled by said web acting as a hinge to allow said cap portion and said actuator to rotate relative to each other around an axis which lies generally perpendicular to the central axes of said cap portion and said actuator.

15. A closure as claimed in claim 14 or 15, wherein said actuator snaps onto said cap portion with said interconnecting web maintaining connection.

16. A closure as claimed in anyone of claims 13 to 15, wherein said interconnecting web acts as a tamper evident means when the actuator and cap portion are assembled.

17. A closure as claimed in any one of claims 1 to 13, wherein said cap portion includes a frangible ring located around an upper portion thereof to act as a tamper evident means.

18. A closure as claimed in any one of claims 13 to 16, wherein said cap portion includes a frangible ring located around an upper portion thereof to act as a tamper evident means.

19. A closure as claimed in claim 18, wherein said frangible ring includes a recess portion to receive said interconnecting web, so that when said actuator and cap portion are assembled the frangible ring, in use is able to be pulled away from said cap portion and in doing so break said interconnecting web, thereby allowing said actuator to be rotated relative to said cap portion.

20. A closure as claimed in any one of the preceding claims wherein said cap portion and actuator can have on external circumferential surfaces thereof a moulded grip means which also indicates relative directions of rotation of said cap portion and said actuator.

21. A closure as claimed in any one of the preceding claims wherein said cap portion at said first end includes a tamper evident mechanism so as to identify, after said cap portion has been attached to said opening of said container, whether said cap portion has been removed from said container opening.

22. A closure as claimed in any one of the preceding claims wherein said cap portion includes an internal shoulder so as to receive therein a capsule so that removal of the cap portion from said container opening will also remove said capsule.

23. A closure as claimed in any one of the preceding claims wherein said inclined surface includes at least one tooth or cutting edge.

24. A capsule having a skirt with a first sealable rim at a first end and second sealable rim at a second end, said first and second ends respectively having first and second membranes to seal the volume between said first and second ends, said capsule having an internally located support surface to support a substance to be dispensed from said capsule, said support surface including cutting means between said support surface and said first end so that in use force exerted onto said support surface will cause said cutting means to engage and then cut said first membrane.

25. A capsule as claimed in claim 24, wherein said cutting means includes one or more teeth and or a knife like formation.

26. A capsule as claimed in claim 24 or 25, wherein said cutting means is positioned near to the periphery of said support surface.

27. A capsule as claimed in any one of claims 24 to 26, wherein said capsule has a space between said support surface and said second sealable rim to house said substance to be dispensed from said capsule.

28. A capsule as claimed in any one of claims 24 to 27, wherein said substance is used to transfer force to said support surface to thus break said frangible membrane on said first end.

29. A capsule as claimed in any one of claims 24 to 28 wherein said support surface is connected by frangible connectors to said skirt. so that when force is exerted onto said support surface the frangible connectors will break leaving said support surface hingedly connected to the skirt.

30. A capsule as claimed in any one claims 24 to 29 wherein an external surface of said skirt includes a radially outwardly extending annular flange.

31. A capsule as claimed in claim 30, wherein said radially outwardly extending annular flange is adapted to be received inside of said cap portion of said closure as claimed in any one of claims 1 to 23, to thereby seal with a rim of an opening of said container.

32. A capsule as claimed in claim 31, wherein said capsule serves as a plug means to occlude a container opening with said capsule being held in sealing engagement to said container opening by said cap portion.

33. A capsule as claimed in any one of claims 24 to 32, wherein said support surface is rotatably connected to said skirt at or near to said first end.



34. A capsule as claimed in claim 33, wherein said support surface is rotatably connected to said skirt by a hinge.

35. A capsule as claimed in claim 33 or 34 wherein a stop is provided whereby once said support surface has rotated past said stop it cannot return past said stop.

5 36. A capsule as claimed in claim 35 wherein said stop requires a portion of said support surface to deform to allow said support surface

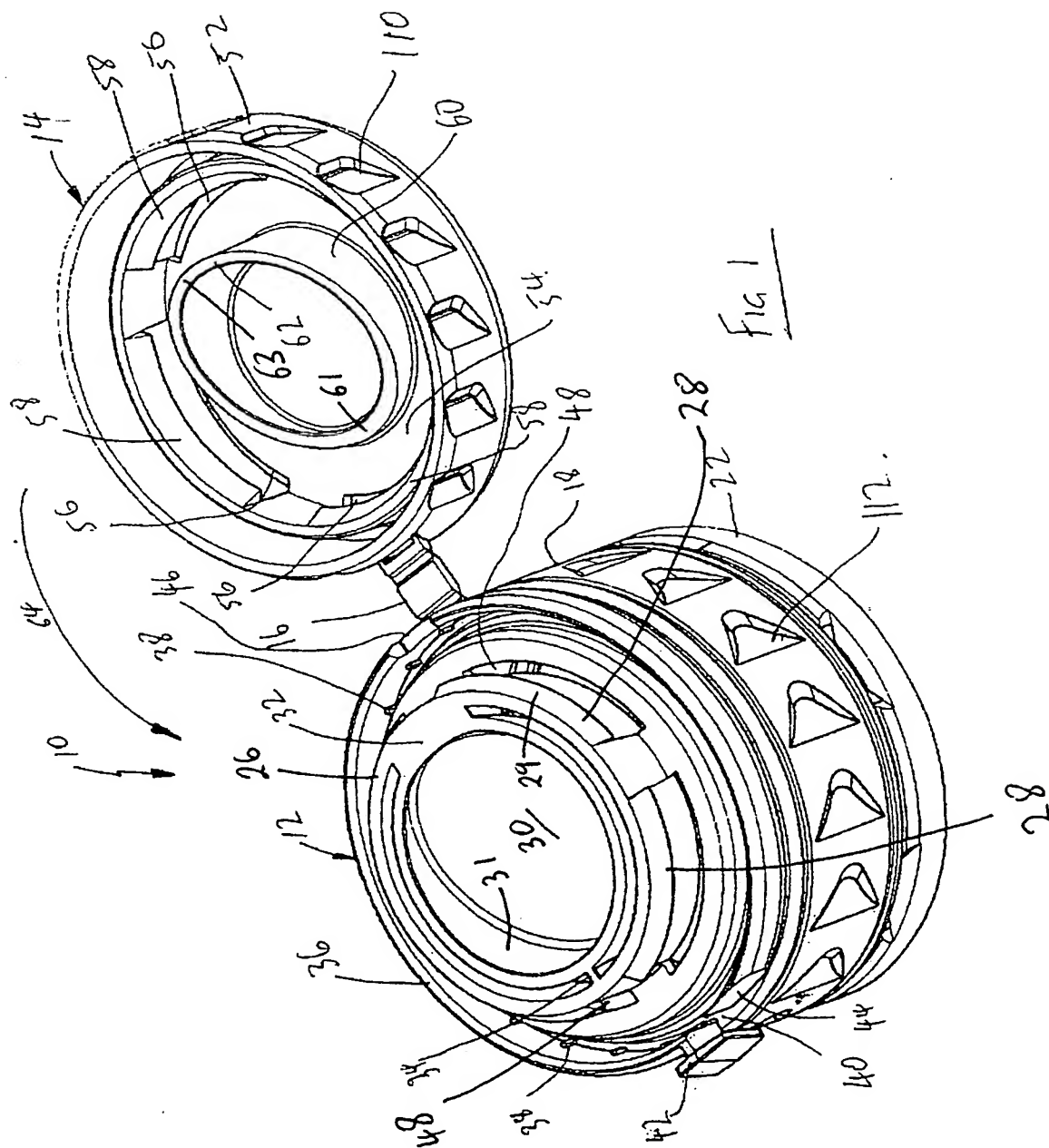
37. A capsule as claimed in any one of claims 24 to 32, wherein said support surface is held by frangible connectors to said skirt, and when said support surface cuts said first membrane, said support surface remains connected to said first membrane which remains connected to said skirt.

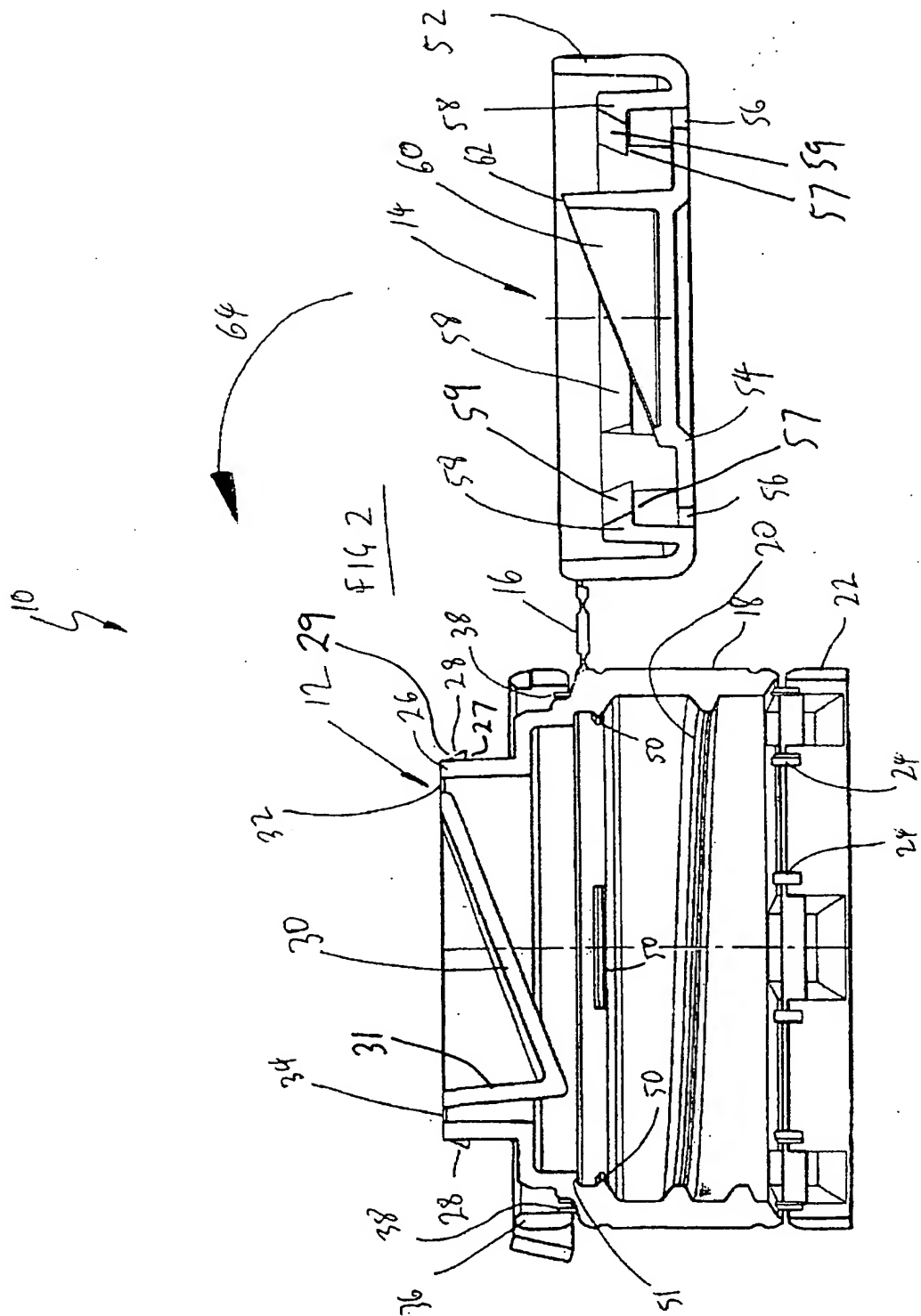
10 38. In combination, a closure as claimed in any one of claims 1 to 23 and a capsule as claimed in any one of claims 24 to 37, wherein said capsule contains a first substance and a frangible seal at least on said first end of said capsule, said closure and capsule sealing a container opening of a container holding a second substance, said closure and said capsule being used to move said first substance into  
15 onto said first substance thereby moving said support surface towards said frangible seal on said first end to thus cut or break said frangible seal allowing said first substance to access said second substance.

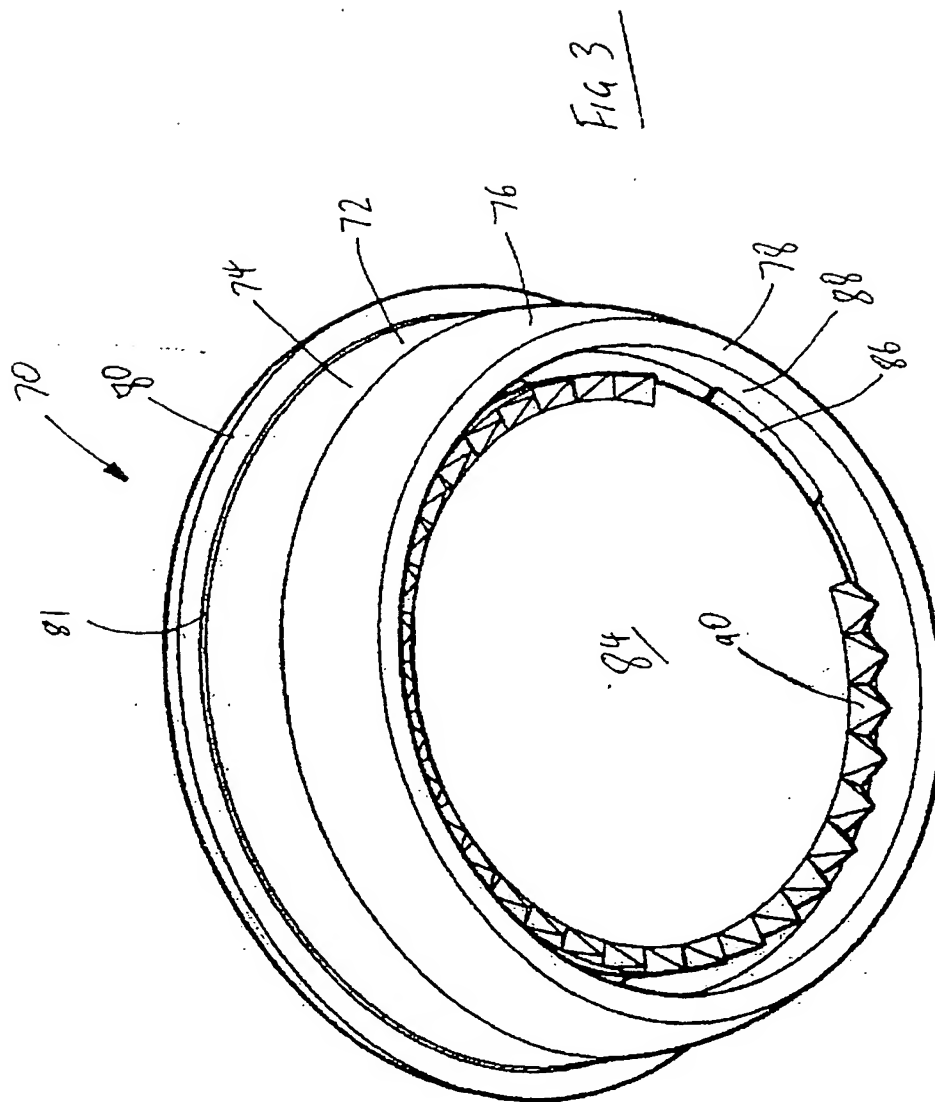
39. The combination of claim 38, wherein said first substance is a gas or liquid and said second membrane located on said second end of said capsule has sufficient elasticity so as not to break or rupture when force is exerted from said inclined surface.

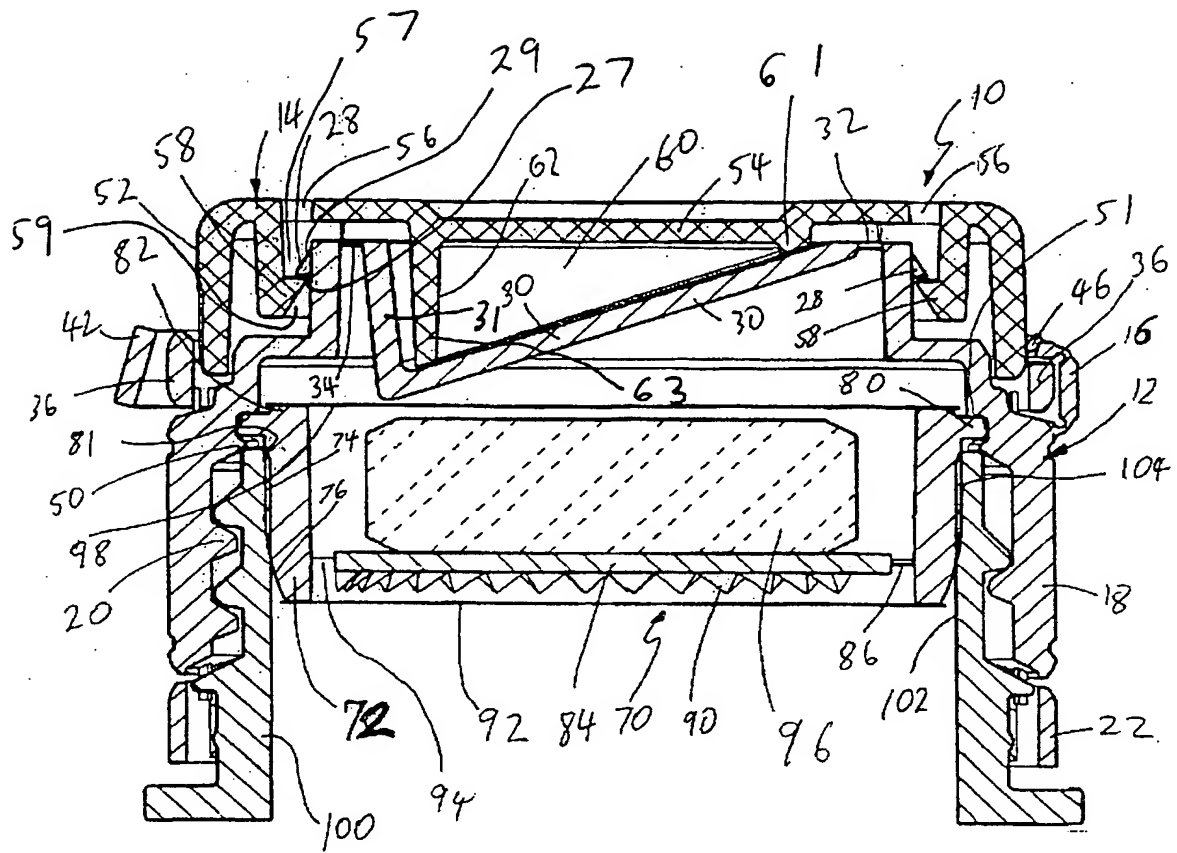
20 40. The combination of claim 38, wherein said first substance is a generally circular tablet or a flowable granulated product or powder and said support surface has a ring of cutters therearound so that a part circular opening is formed in said first membrane at said first end of said capsule allowing said tablet to fall therethrough.

25 41. The combination as claimed in any one of claims 38 to 40, wherein said capsule has two sealing locations with said opening, a first location being with the internal surfaces of said opening of said container and a second being with the outer rim of said opening.

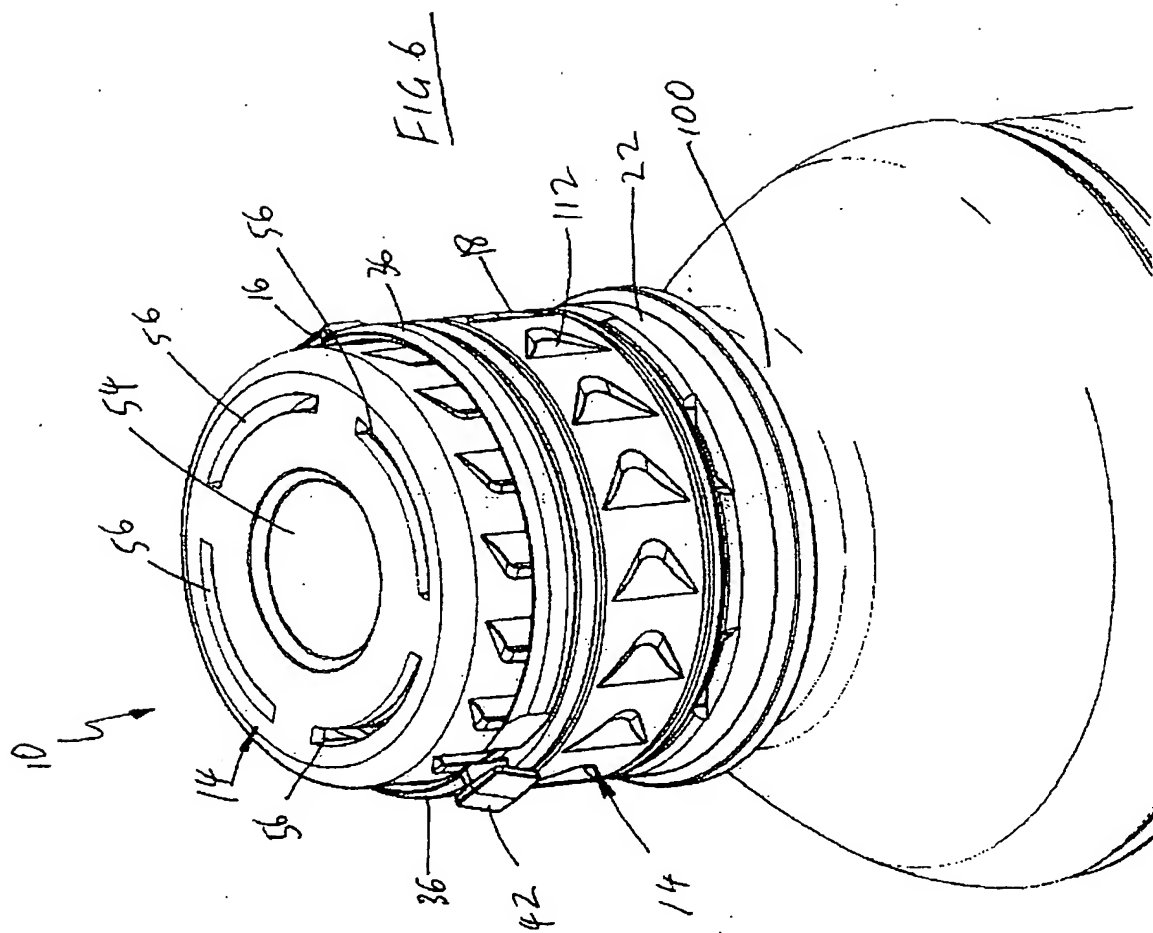






FIG 4





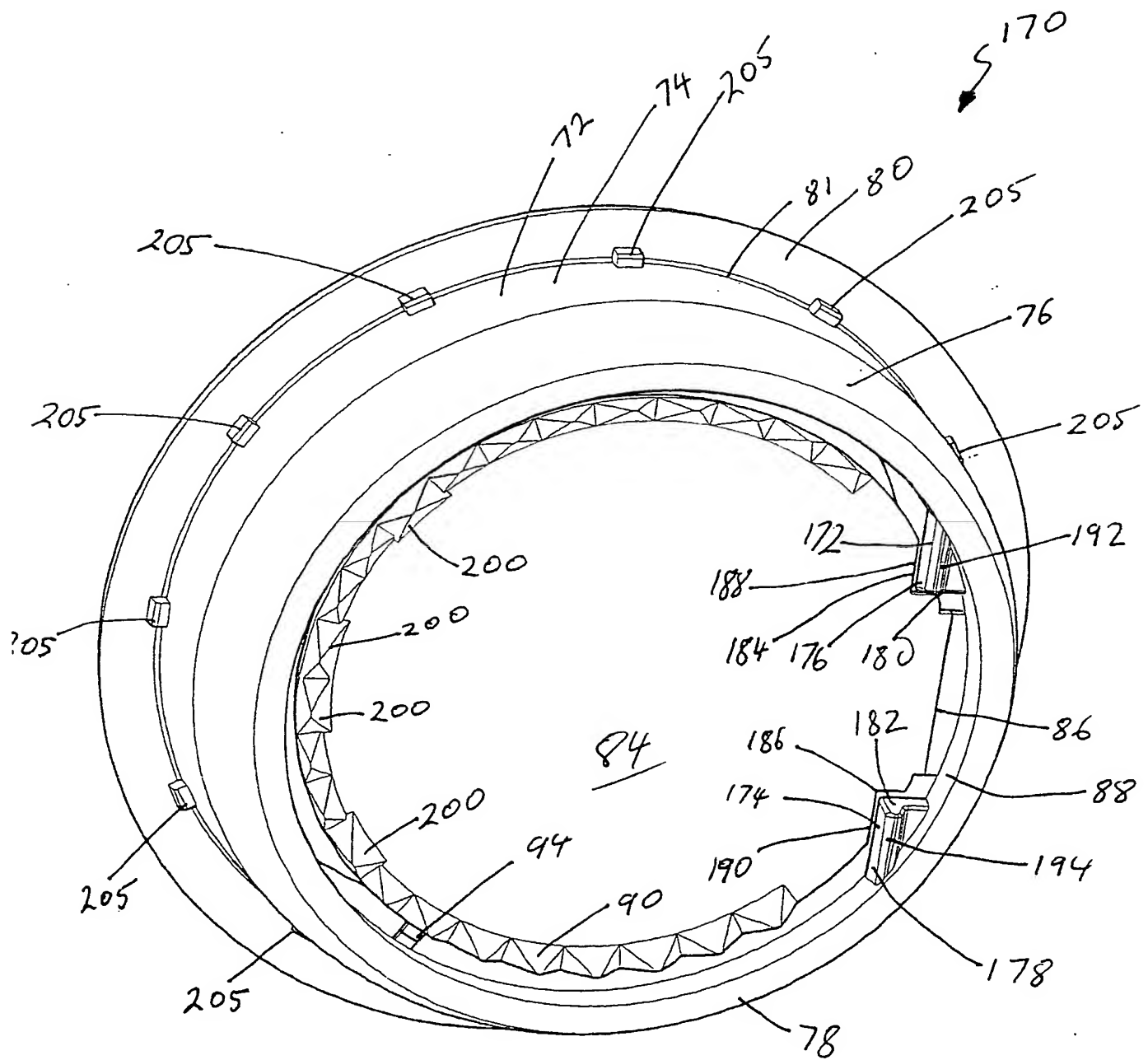


FIG 7



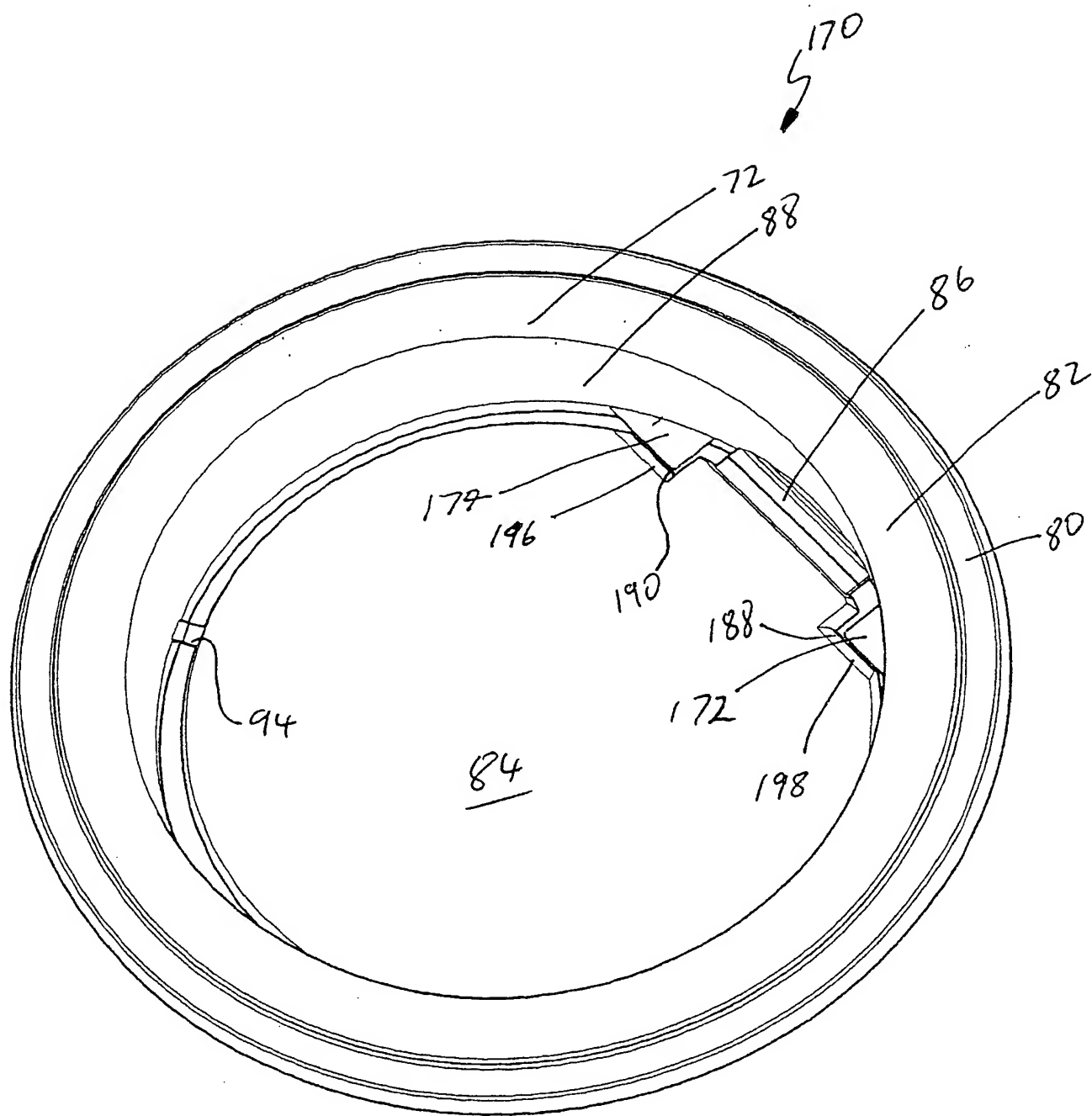
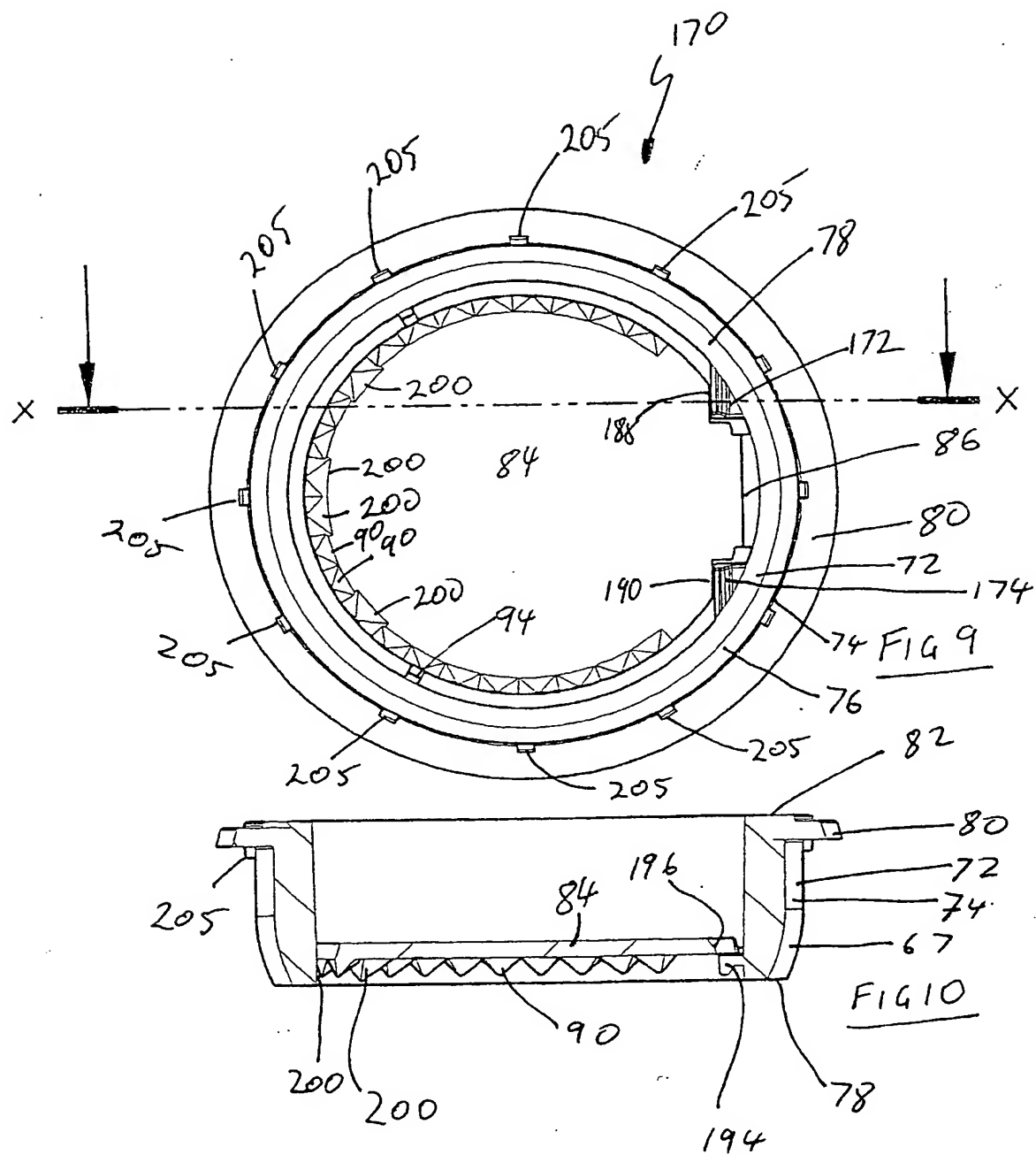


Fig 8





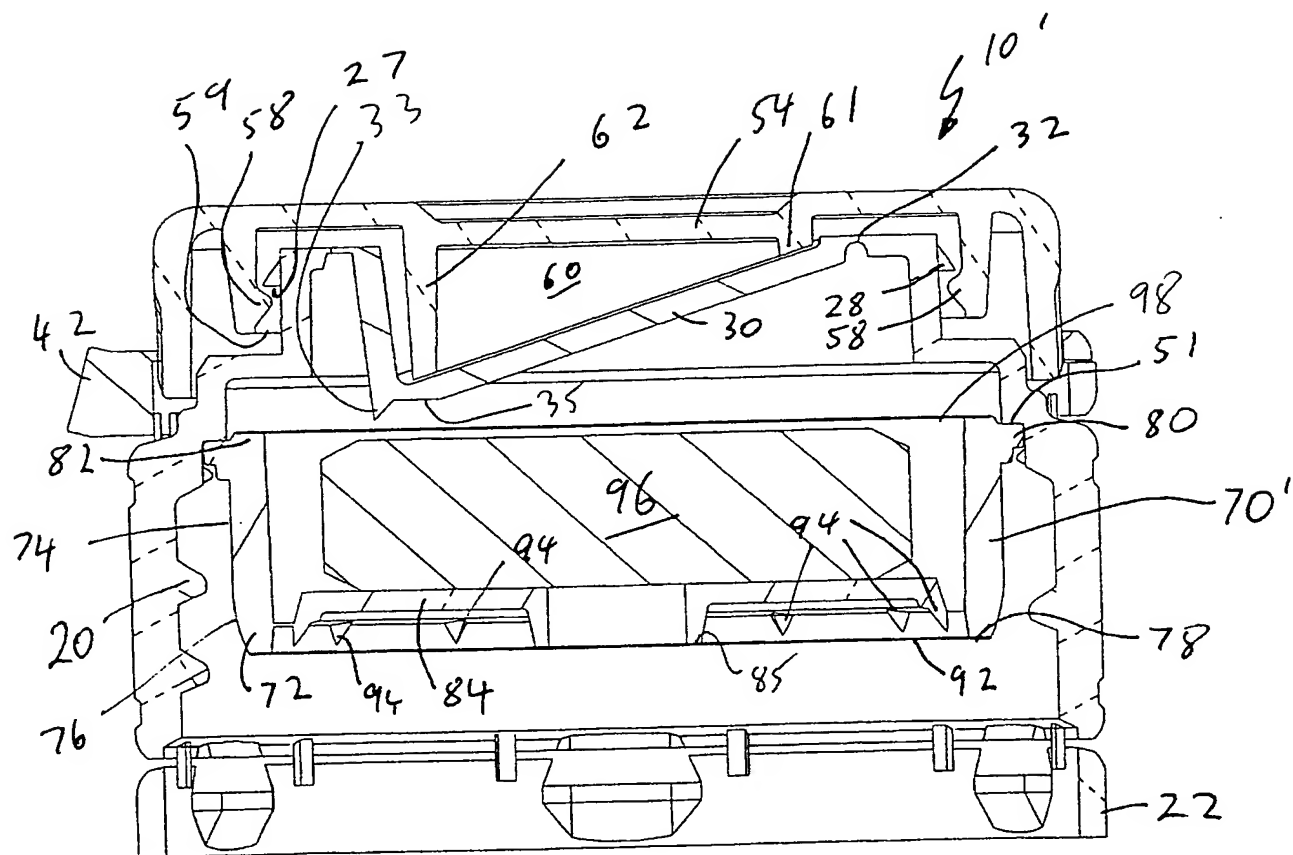


FIG 12

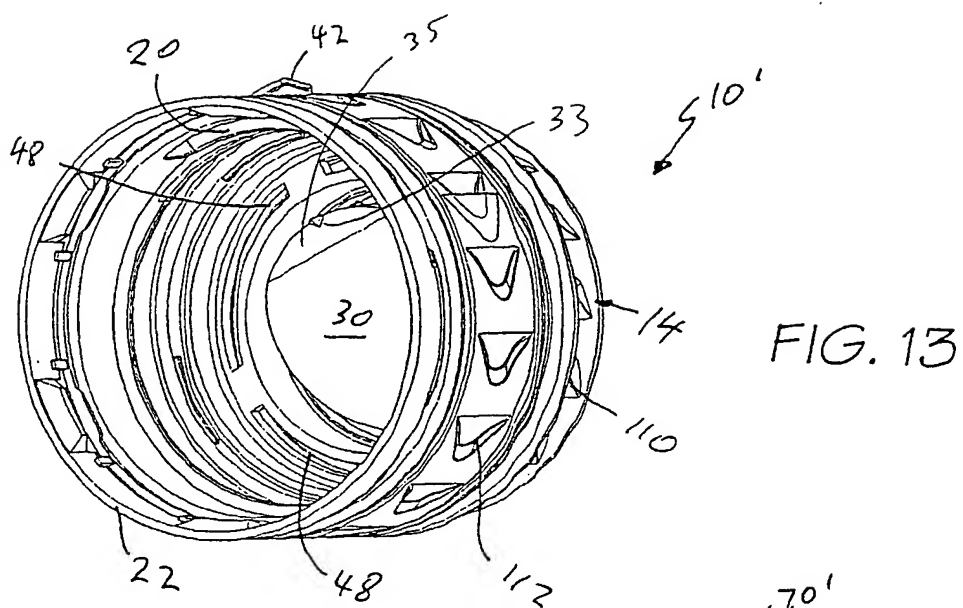


FIG. 13

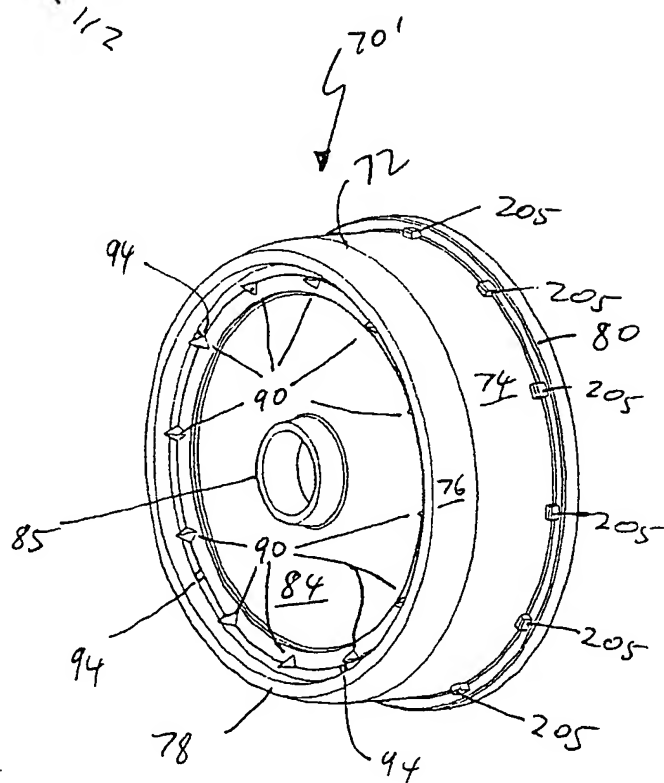


FIG. 14

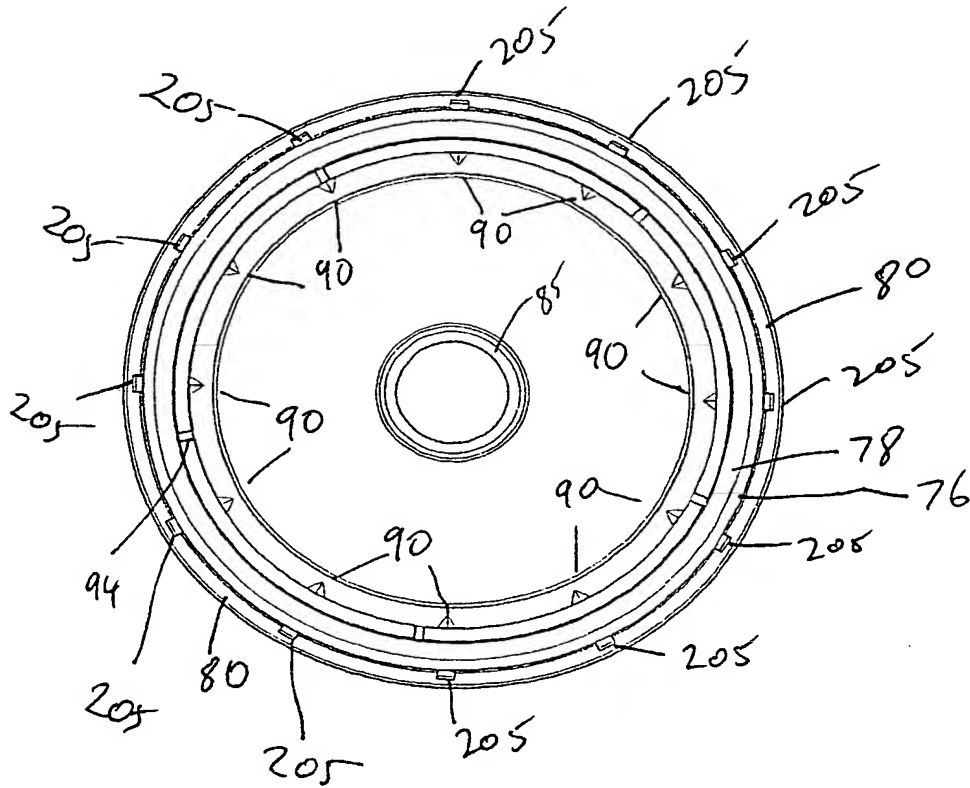


FIG. 15

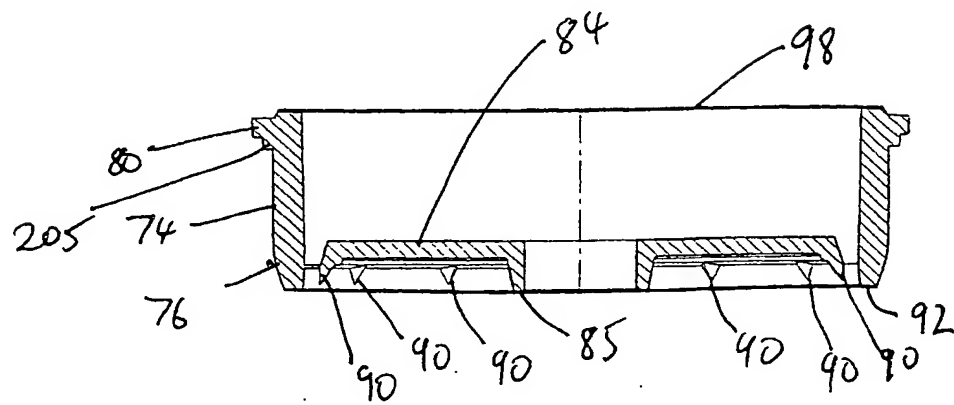
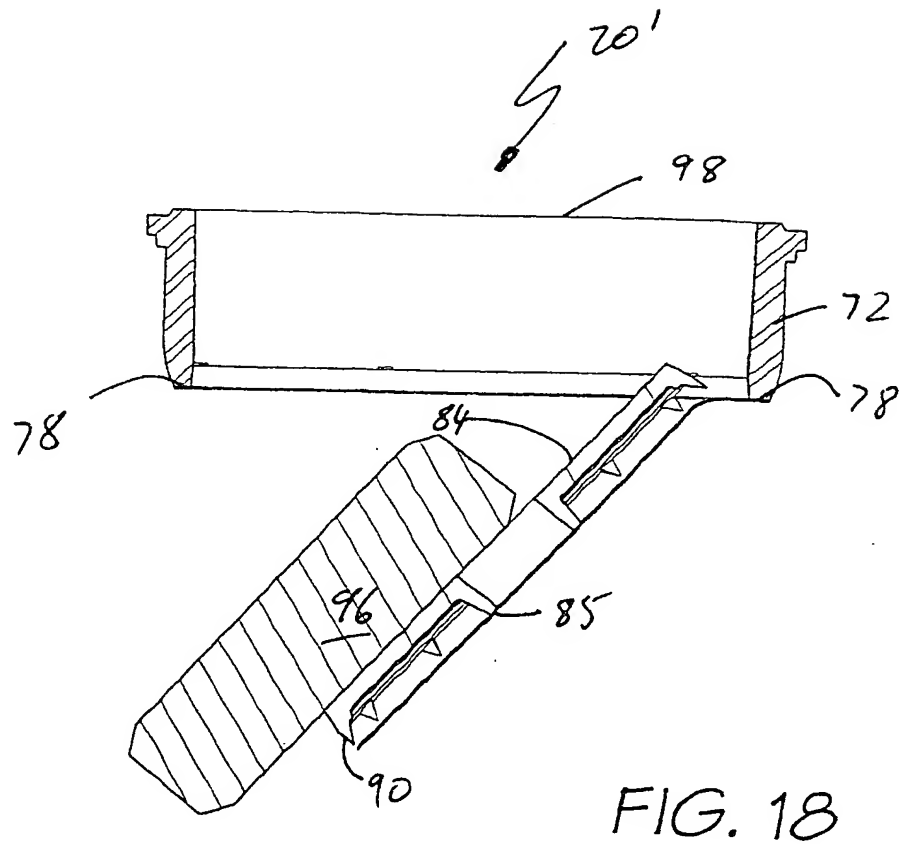
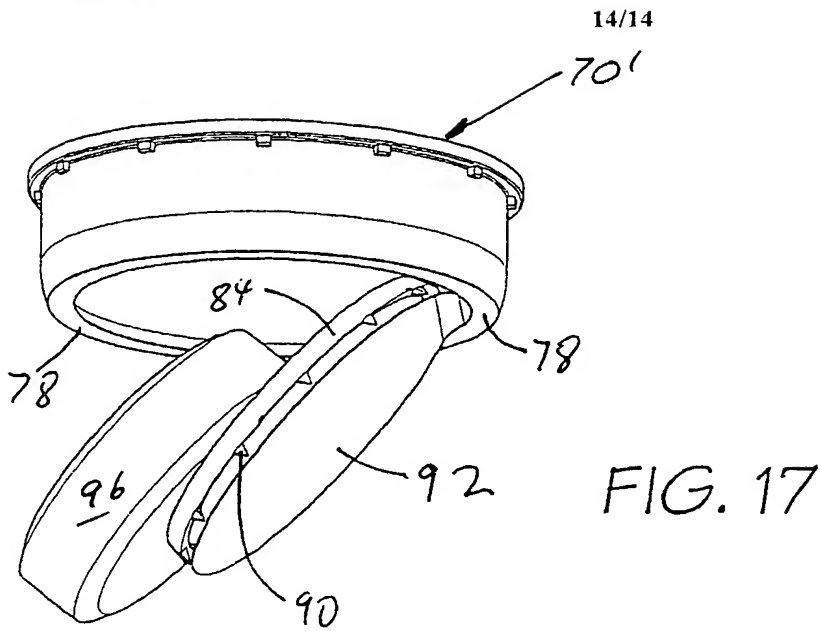


FIG. 16



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01664

**A. CLASSIFICATION OF SUBJECT MATTER**Int. Cl. <sup>7</sup>: B65D 25/08, 51/22, 81/32, 83/04

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

ELECTRONIC SEARCH AS BELOW

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
DWPI, IPC B65D 25/08, 51/-, 41/-, 55/-, 81/32, 83/04, and keywords (cap, lid, taper, wedge, press, twist, membrane, frangible, tear, pierce)**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2298406 A (BESPAK PLC et al) 4 September 1996	1 to 23
Y	See figure 4	38 to 41
X	WO 00/27717 A (COORY) 18 May 2000	24 to 37
Y	See figure 7, 14 and 17.A	38 to 41
X	EP 0538094 B1 (SOLLAC) 10 January 1996	1 to 23
	See figure 4 and 6	

☒ Further documents are listed in the continuation of Box C
 ☒ See patent family annex

* Special categories of cited documents:		"T"	Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	Document defining the general state of the art which is not considered to be of particular relevance	"X"	Document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	Earlier application or patent but published on or after the international filing date	"Y"	Document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	Document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	Document member of the same patent family
"O"	Document referring to an oral disclosure, use, exhibition or other means		
"P"	Document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search  
26 February 2002

Date of mailing of the international search report 2 APR 2002

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01664

**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99/19221 A1 (BIOGAIA BIOLOGICS AB) 22 April 1999 See figure 7, 8 and 10	1 to 41

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01664

## Box I Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

☐ Claims Nos :

because they relate to subject matter not required to be searched by this Authority, namely:

☐ Claims Nos :

because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

☐ Claims Nos :

because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

## Box II Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The international application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In coming to this conclusion the International Searching Authority has found that there are different inventions as follows:

Claims 1 to 23 relate to a container closure. It is considered that the features of the container closure comprises a first "special technical feature".

Claims 24 to 37 relate to a capsule having a sealable skirt and an internally located support surface. It is considered that the features of the capsule comprises a second "special technical feature".

Since the abovementioned groups of claims do not share any of the technical features identified, a "technical relationship" between the inventions, as defined in PCT rule 13.2 does not exist. Accordingly the international application does not relate to one invention or to a single inventive concept, a priori.

☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims

☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT  
Information on patent family members

International application No.  
PCT/AU01/01664

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
GB	2298406	EP	810955	US	6047818	WO	9626126
WO	200027717	AU	200010853	EP	1149026		
EP	538094	CA	2079979	FR	2682358	JP	5305944
		US	5292025				
WO	9919221	AU	97998/98	CA	2306512	EP	1037811
		NO	20001928	US	6105760	US	2001004054
		US	6209718	US	6098795	AU	200037344
		EP	1181203	NO	20014368	WO	200053507

END OF ANNEX

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